REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
03-05-2011	Master of Military Studies Research Paper	September 2009 - April 2010

4. TITLE AND SUBTITLE
Persistent Intelligence, Surveillance, and Reconnaisance (P-ISR): Debunking the Myth, Establishing the Concept, and Achieving the Possible

5a. CONTRACT NUMBER
N/A

5b. GRANT NUMBER
N/A

5c. PROGRAM ELEMENT NUMBER
N/A

6. AUTHOR(S)
Major Jason B. Mitchell

5d. PROJECT NUMBER
N/A

5e. TASK NUMBER
N/A

5f. WORK UNIT NUMBER
N/A

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
USMC Command and Staff College
Marine Corps University
2076 South Street
Quantico, VA 22134-5068

8. PERFORMING ORGANIZATION REPORT NUMBER
N/A

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
N/A

10. SPONSOR/MONITOR'S ACRONYM(S)
N/A

11. SPONSORING/MONITORING AGENCY REPORT NUMBER
N/A

12. DISTRIBUTION AVAILABILITY STATEMENT
Unlimited

13. SUPPLEMENTARY NOTES
N/A

14. ABSTRACT
P-ISR is an emerging concept in the United States Marine Corps (USMC) that differs from previous P-ISR notions. Historically, P-ISR has been synonymous with an "unblinking eye" capability. However, DOD has never defined P-ISR, and DOD refers to single systems that provide the "unblinking eye" capability as P-ISR. The Marine Corps envisions P-ISR as a more robust capability, and is the first branch of service to characterize the concept and define the P-ISR term. However, the Marine Corps has neglected to define the anchor of the P-ISR term—persistence. The current Marine Corps draft P-ISR definition does not reflect persistence, nor does it accurately address the Marine Corps' P-ISR requirement. Based on interviews, literature, and available reports, the desired Marine Corps P-ISR capability is achievable. The Naval Post Graduate School is currently developing a P-ISR architecture that would enable the Marine Corps to achieve its P-ISR endstate. By addressing persistence and P-ISR definitions, the Marine Corps can leverage available P-ISR models to achieve a true P-ISR capability.

15. SUBJECT TERMS
Persistent, P-ISR, ISR, Intelligence

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE	UU		Marine Corps University / Command and Staff College
Unclass	Unclass	Unclass			19b. TELEPONE NUMBER *(Include area code)* (703) 784-3330 (Admin Office)

United States Marine Corps
Command and Staff College
Marine Corps University
2076 South Street
Marine Corps Combat Development Command
Quantico, Virginia 22134-5068

MASTER OF MILITARY STUDIES

PERSISTENT INTELLIGENCE SURVEILLANCE AND RECONNAISSANCE (P-ISR): DEBUNKING THE MYTH, ESTABLISHING THE CONCEPT, AND ACHIEVING THE POSSIBLE

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF MILITARY STUDIES

MAJOR JASON MITCHELL

AY 10-11

Mentor and Oral Defense Committee Member: Jonathan F. Phillips
Approved: [signature]
Date: 3 May 2011

Oral Defense Committee Member: Eric Shibuya
Approved: [signature]
Date: 3 MAY 2011

Executive Summary

Title: Persistent Intelligence Surveillance and Reconnaissance (P-ISR): Debunking the Myth, Establishing the Concept, and Achieving the Possible.

Author: Major Jason Mitchell, United States Marine Corps

Thesis: The Marine Corps has two problems in its Persistent ISR concept- establishing persistence and defining P-ISR, and by addressing these problems, can leverage the Naval Post Graduate School's P-ISR model to achieve a true P-ISR capability.

Discussion: P-ISR is an emerging concept in the United States Marine Corps (USMC) that differs from previous P-ISR notions. Historically, P-ISR referred to individual systems that provided a temporal and spatial capability through Imagery Intelligence (IMINT) specific to a designated target. The term was synonymous with an "unblinking eye" capability. However, DOD has never defined P-ISR, and although DOD referred to this "unblinking eye" capability as P-ISR, the systems really provided persistent surveillance. The Marine Corps envisions P-ISR as a more robust capability, and is the first branch of service to characterize the concept and define the P-ISR term. However, the Marine Corps has placed artificial barriers within its overarching Intelligence operating concept that limits the P-ISR scope, and it has neglected to define the anchor of the P-ISR term—persistence. P-ISR has responsibility to the entire intelligence process. By defining persistence and P-ISR, the Marine Corps can modify its Intelligence operating concept to reflect this responsibility. The current Marine Corps draft P-ISR definition does not reflect persistence, nor does it accurately address the Marine Corps' P-ISR requirement. In short, the Marine Corps' P-ISR definition simply describes a strategy that restates current doctrine.

Based on interviews, literature, and available reports, the desired Marine Corps P-ISR capability is achievable. The Naval Post Graduate School is currently developing a P-ISR architecture that would enable the Marine Corps to achieve its P-ISR endstate.

Conclusion: P-ISR is achievable. Currently, the Marine Corps has successfully established that its P-ISR concept is different from historical notions; however, it has failed to distinguish the capability from current doctrine. The Marine Corps has not defined what persistence is, thus has not used that concept to anchor its P-ISR definition. The Marine Corps must validate and codify persistence, and then use persistence to re-define the P-ISR term and concept so that P-ISR aligns with the requirements. The Marine Corps will then be better postured to leverage financial resources to fund current efforts that will allow the Marine Corps to achieve a true P-ISR capability.

DISCLAIMER

THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENT AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

ACRONYMS

AOI	Area of Interest
C2	Command and Control
CBA	Capabilities Based Assessment
CIA	Central Intelligence Agency
COI	Conditions of Interest
DCGS	Distributed Common Ground/Surface System
DCGS-MC	Distributed Common Ground/Surface System Marine Corps
DOD	Department of Defense
DIB	DCGS Integration Backbone
DIRINT	Director of Intelligence
EDC	External Dissemination Components
EO	Electro Optical
GEOINT	Geospatial Intelligence
HAA	High Altitude Airship
HUMINT	Human Intelligence
ICD	Initial Capabilities Document
IMINT	Imagery Intelligence
IPL	Integrated Priority List
ISR	Intelligence, Surveillance, and Reconnaissance
JFC	Joint Force Commander
JIC	Joint Integrating Concept
JIEDDO	Joint Improvised Explosive Device Defeat Organization

JP	Joint Publication
JTF	Joint Task Force
MAGTF	Marine Air Ground Task Force
MASINT	Measurements and Signals Intelligence
MCDP	Marine Corps Doctrinal Publication
MCISR-E	Marine Corps Intelligence Surveillance and Reconnaissance Enterprise
MCVS	Marine Corps Vision and Strategy
MEF	Marine Expeditionary Force
MGL	Marine Air Ground Task Force Task List
MROC	Marine Requirements Oversight Council
NAI	Named Area of Interest
NRT	Near Real Time
OIF	Operation Iraqi Freedom
OSINT	Open Source Intelligence
P-ISR	Persistent Intelligence Surveillance and Reconnaissance
POM	Program Objective Memorandum
PPBE	Planning, Programming, Budgeting, and Execution
RMA	Revolution of Military Affairs
ROMO	Range of Military Operation
SIGINT	Signals Intelligence
UAS	Unmanned Aerial System
US	United States
USMC	United States Marine Corps

USAF	United States Air Force
WAAS	Wide Area Airborne Surveillance

Table of Contents

Page

Preface

Throughout my career as a Marine Air Ground Task Force Intelligence Officer, I have witnessed firsthand the Marine Corps' struggle with intelligence challenges presented by the current operating environment. The Marine Corps strives to reduce uncertainty on the battlefield by making available to the supported commander accurate, timely, and relevant knowledge about the threat and surrounding environment to support decisions. Doctrinally, this is the goal of Marine Corps Intelligence. To achieve this goal, the Marine Corps employs a vast array of intelligence collections capabilities. These capabilities range from airborne imagery platforms and ground sensors to the individual Marine on the ground and the reports that the Marine generates. The Marine Corps strives to use all the available information to generate the "golden nugget" of information that will drive or support the commander's decision process.

From 2004 to 2006, I served as the Battalion Intelligence Officer for 2d Battalion 5th Marines where I provided intelligence support across the range of military operations — from combat operations in Ar Ramadi, Iraq to expeditionary operations in the Pacific Command Area of Operations. The overarching theme I witnessed during this time was the stovepiped nature of the Marine Corps' intelligence capabilities. In other words, it was extremely difficult to bring together in a timely fashion the available information produced by multiple intelligence collection efforts. In Ar Ramadi, I had a Human Intelligence Exploitation Team, a Marine Unmanned Aerial Vehicle Squadron detachment, imagery and topographic support, all source support, as well as the occasional Signals Intelligence Support Team. These capabilities were unprecedented at the battalion level, and this improved battalion-level construct helped me meet the unique challenges of the operating environment. Yet, despite these robust capabilities, it was still difficult to paint an accurate picture due to time lags in available information as each

capability went through its individual process before a finished intelligence product made its way to the battalion.

Following my tour with the battalion, I had tours at both the Marine Division and the Marine Corps Combat Development Command (MCCDC) where I became more familiar with the stovepiped nature of intelligence collection. At the Division level, the Intelligence Operations Center brought together organic and non-organic intelligence collection capabilities to support Division operations. However, as witnessed at the infantry battalion, intelligence continued to be stovepiped, but on a larger scale. It was not until I arrived at MCCDC that I became familiar with the Marine Corps' P-ISR concept and ultimately spent one year as the study director for the Marine Corps' process to develop a P-ISR capability

The goal of this paper is to show that the Marine Corps is close to achieving a P-ISR capability. However, the Marine Corps has a gap in how it characterizes persistence and needs to better define P-ISR so that the definition reflects persistence and the Marine Corps' P-ISR requirement. That is to say, without codifying what it means by both persistence and P-ISR, the Marine Corps faces the occasion that P-ISR becomes another term that reflects what it has always done. By codifying persistence and P-ISR, the Marine Corps can leverage available capabilities that would allow the Marine Corps to achieve a true P-ISR capability. A P-ISR capability in Ar Ramadi, Iraq would have been a force multiplier, and would have dramatically increased the operational tempo at which the battalion operated. I can attest firsthand the benefits of a P-ISR capability supporting both combat and expeditionary operations.

There is a lack of published P-ISR literature, yet I have received considerable support over the past two years in the P-ISR effort. Many individuals have made themselves available for interviews as well as generally helping me better understand their perspectives relative to

their areas of expertise. I would specifically like to thank Col Phil Gentile, currently the Executive Assistant to the Marine Corps' Director of Intelligence, who was the first to mentor me on the P-ISR concept. I would also like to thank Col John Crane, Col William Seely, LtCol Dave Yost and Bobby Straight at MCCDC who helped shape the direction of the P-ISR study, and never failed to provide me with guidance and perspective. I would like to thank my academic advisor, Dr. Jonathan Phillips, for helping me transform my many ideas into a coherent and administratively complete document. Finally, I would be remiss if I did not recognize and thank my wife, Kelly. She encouraged me to write on the subject and displayed incredible patience despite some unfavorable hours spent researching and writing. Without her unwavering support, I could not have completed this project.

INTRODUCTION

> Accurate, timely, and relevant intelligence is critical to the planning and conduct of successful operations. Effective intelligence uncovers enemy weaknesses which can be exploited to provide a decisive advantage. Shortfalls in intelligence can lead to confusion, indecision, unnecessary loss of life, mission failure, or even defeat.
>
> — *MCDP 2: Intelligence*

> The resources at our disposal are not always obvious, can change during the course of a struggle, and usually need to be adapted to suit our needs. Our adversary often refuses to fit our preconceptions of him or to stand still while we erect the apparatus for his destruction.
>
> — *MCDP 1-1: Strategy*

Persistent Intelligence Surveillance and Reconnaissance (P-ISR) is an emerging concept in the United States Marine Corps (USMC) that differs from previous P-ISR notions. Historically, P-ISR referred to individual systems that provided a temporal and spatial capability through Imagery Intelligence (IMINT) specific to a designated target. The term was synonymous with an "unblinking eye" capability. However, the Department of Defense (DOD) has never defined P-ISR, and although DOD referred to this "unblinking eye" capability as P-ISR, the systems really provided persistent surveillance. The Marine Corps envisions P-ISR as a comprehensive capability, and is the first branch of service to characterize the concept and define the P-ISR term. However, the Marine Corps has placed artificial barriers within its overarching Intelligence operating concept that limits the P-ISR scope to planning, directing, and collecting of intelligence. P-ISR has responsibility to the entire intelligence process, not just planning, directing, and collecting. Additionally, the Marine Corps has neglected to define the anchor of the P-ISR term — persistence. By defining persistence and P-ISR, the Marine Corps can modify its Intelligence operating concept to reflect this responsibility. The current Marine Corps draft P-ISR definition does not reflect persistence, nor does it accurately address the Marine Corps' P-

ISR requirement. In short, the Marine Corps' P-ISR definition simply describes a strategy that restates current doctrine.

Based on interviews, literature, and available reports, the desired Marine Corps P-ISR capability is achievable. The Naval Post Graduate School is currently developing a P-ISR architecture that would enable the Marine Corps to achieve its P-ISR endstate. But, the Marine Corps has two problems in its Persistent ISR concept — establishing persistence and defining P-ISR, and by addressing these problems, can leverage the Naval Post Graduate School's P-ISR model to achieve a true P-ISR capability.

P-ISR: A HISTORICAL PERSPECTIVE

The United States' true Intelligence collection capabilities are mostly unknown to the American public. Hollywood movies shape public perceptions by portraying dramatic intelligence capabilities where there is no escape from the "unblinking eye" created by modern technology. Paramount Pictures' 1992 release of *Patriot Games* portrayed the Central Intelligence Agency's (CIA) ability to re-task satellites to broadcast live feeds of operations conducted at night in Africa.[1] Similarly, Touchstone Pictures' 1998 release of *Enemy of the State* depicts the ability to change satellite orbits instantly to locate a moving target, deliver live high-definition feeds in color capable of detecting facial features, infinitely track a target through time and space, and access earlier recorded events in a "TiVo-like" fashion to locate the target.[2] Additionally, the ability to integrate cell phone intercepts and cameras located inside of buildings and on the ground further enhanced these notional capabilities that prevented the target from escaping the collector's purview. When combined, these sensors created a network of intelligence collection capabilities that allowed the resource user to develop near-perfect awareness of the situation as it developed by maintaining a consistent track on both the target's

location and, at times, the target's intentions. The Hollywood example, while fictitious, presents an interesting parallel to the United States' Revolution of Military Affairs (RMA) concept and the more recent US military intelligence collection efforts in the 21st Century.

In 1996, Joseph Nye and William Owens postulated that the United States was experiencing a RMA due to an information revolution that would provide DOD with the "ability to collect, process, act upon, and disseminate information...that will almost certainly grow over the next decade." [3] They predicted that multiple sensors would be able to provide real- time surveillance over large geographical areas in all weather conditions in which individuals could analyze vast amounts of collected data and disseminate that data to US forces in order to create dominant battlefield awareness. The result would be a disparity in knowledge giving the US an asymmetrical advantage over her enemies.[4]

By 2003, the military Intelligence, Surveillance, and Reconnaissance (ISR) community focused on achieving this disparity in knowledge by focusing collection capabilities on achieving a "Holy Grail"— a capability that integrated and networked multiple sensors designed to accelerate and increase the flow of valuable information to the warfighter in order to increase situational awareness.[5] These efforts were an attempt to improve persistence on the battlefield. At the time, the Hollywood example that created persistence, or the "unblinking eye", through a network of multiple sensors was unachievable. Additionally, the ISR community never defined persistence. In 2006, a DOD ISR document noted that "numerous experiments... failed to determine the true nature of the problem of persistence and...consequently provided few answers or recommendations for solutions beyond simply increasing and improving collection capabilities."[6]

Capability improvements included creating overhead imagery capabilities with long-term "dwell" that could achieve an "unblinking eye" on the battlefield. In a historical context, the term P-ISR became synonymous with a single system that provides an always-present "unblinking eye" over a specified area, and the "unblinking eye" remains the commonly associated capability today.

In 2006, Combatant Commanders consistently identified P-ISR as a capability gap in their Integrated Priority Lists (IPL).[7] In 2007, the journal *Defense Daily* published an article stating that US forces operating in Iraq and Afghanistan need more P-ISR.[8] In 2008, Lockheed Martin publicly released concepts for a High Altitude Airship (HAA) that touted the line, "Global Persistent ISR: Always There, Always On."[9] In 2009, *Avionics Magazine* published an article forecasting a $44.5 billion world market for unmanned P-ISR programs through 2019.[10] In 2010, Major Ryan Guldan, USAF, proposed in a thesis for the Air Command and Staff College that the ability of near-space air ships to carry large payloads and loiter at altitudes over 65,000 feet for months at a time provides the solution to DOD's P-ISR dilemma.[11] Ironically, all of these documents describe a single system that loiters over a specific target for a sustained period, but none of these documents provides a P-ISR definition. P-ISR has become synonymous with a term that describes a single capability required by battlefield commanders, and it is a buzzword that garners much interest in order to gain financial support from both private sector and government organizations. However, the Marine Corps is not immune to mislabeling these capabilities as P-ISR. One such system that garnered much P-ISR visibility was the United States Marine Corps' Angel Fire program.

Angel Fire (see Appendix A) was a program funded by the Joint Improvised Explosive Device Defeat Organization (JIEDDO) in 2007 to support an urgent Joint and Marine Corps

requirement to provide a "24 hour, seven day a week organic persistent-ISR stare in support of the tactical battlefield commander."[12] It provided a 16 square kilometer electro-optical (EO) imagery capability over a predetermined target at a resolution of .5 meters. Angel Fire provided a near real time (NRT) capability to the supported commander with a latency of eight seconds and a loiter time of roughly four hours per sortie. With the NRT capability came a "TiVo-like" ability at the receive station (a desktop computer) that enabled the commander to rewind data back as far as 7 days at the battalion level and 30 days at the Marine Expeditionary Force (MEF) level. Although it provided similar capabilities to the notional Hollywood example and the historical connotation, Angel Fire was not P-ISR.

By virtue of Joint Publication (JP) 1-02, neither Angel Fire nor the historical P-ISR capabilities provided P-ISR, but rather persistent surveillance- "a collection strategy that emphasizes the ability of some collection systems to linger on demand in an area to detect, locate, characterize, identify, track, target, and possibly provide battle damage assessment and retargeting in near or real-time."[13] The Marine Corps and other government agencies invested nearly $190 billion in Angel Fire, and for varying reasons, the Marine Corps terminated the requirement in 2009. Regardless, Angel Fire provided a persistent surveillance capability, yet received a significant amount of funding while tied to the P-ISR nomenclature. Upon examination of Marine Corps requirements requirements documents, it is further evident that Angel Fire did not provide the required P-ISR capability.

P-ISR REQUIREMENT

To understand the Marine Corps P-ISR objectives, there must be an understanding of the Marine Corps' P-ISR requirement. The Marine Corps Commandant's Vision and Strategy 2025 (MCVS 2025), the Marine Corps' Program Objective Memorandum (POM), and the Marine

Corps ISR Enterprise (MCISR-E) dictate the Marine Corps' P-ISR requirement. MCVS 2025 identifies that in order to " posture for hybrid threats in complex environments... robust intelligence capabilities will support all levels of command awareness and decision making," and that the Marine Corps must pursue the ability to link advanced sensors that provide persistent surveillance over dense and complex areas to users at all echelons, integrate Command and Control (C2) and ISR capabilities to support decentralized decision-making at all echelons of command, and distribute throughout the battlespace fused information from all available resources to create an unprecedented level of battlespace awareness.[14] The Marine Corps' POM process in 2008 further captured the Commandant's requirements as a gap in P-ISR capability. The gap allows the Marine Corps to leverage scarce financial resources to fund the requirement.

The Marine Corps POM is part of the high level Planning, Programming, Budgeting and Execution (PPBE) process. The PPBE process is "intended to drive better resource allocation decisions and support the ultimate objective...which is to provide the Combatant Commanders with the best mix of forces, equipment, support, and quality of life attainable within established fiscal constraints."[15] The POM identifies specific Marine Corps programs and requirements which to apply resources (money). The POM ranks the gaps and requirements based on analysis. The Marine Corps then ranks these gaps in the Marine Air Ground Task Force Gap List (MGL) — a Marine Corps document that lists bone fide Marine Corps needs. In 2009, the Marine Corps identified and validated a P-ISR gap as "a limited ability to establish and maintain an integrated, synchronized, all-source collection architecture to enable persistent collection on a defined geometric [area, route, point] target."[16] P-ISR was the number one intelligence requirement on the MGL for the projected years 2012-2016.[17] The Marine Corps' service intelligence operating concept (MCISR-E) codified this gap as one of three capabilities necessary to achieve the Marine

Corps' overall intelligence capability.

The purpose of the MCISR-E is to support Marine Corps and Joint commanders through an enterprise approach that provides ISR capabilities through a networked architecture of ISR capabilities.[18] There is no doctrinal definition of what constitutes a military enterprise. However, the Marine Corps uses the term "enterprise" to describe a universal approach to

> Develop the policies, organizations, equipment, processes and facilities needed to achieve the synergistic integration of all Service ISR elements into a holistic system, networked across all echelons and functions. This Enterprise encompasses the operating forces, the supporting establishment, and associated systems and personnel.[19]

In other words, the enterprise takes a holistic "view of organizational objectives and processes in order to act cohesively for the good of the entire organization and to achieve outputs with greater efficiency." [20] The Marine Corps has experienced inefficiencies and ineffectiveness within the intelligence community that are the result of performing intelligence operations independently, resulting in intelligence stovepipes, and hoping to fit the pieces together when they meet on the battlefield. Therefore, a well thought out and directed strategy must execute all intelligence functions in a systematic and planned manner. That strategy is the MCISR-E, and identifies P-ISR as that capability to solve the military problem where "the Marine Air Ground Task Force (MAGTF) commander must clearly and accurately understand the battlespace as it exists and anticipate how the battlespace will evolve in order to effectively conduct current operations and prepare for future operations."[21] However, to answer the military problem, the Marine Corps must accurately characterize P-ISR, to include persistence, and provide a validated P-ISR definition.

THE USMC P-ISR CONCEPT

Characterizing P-ISR

Neither DOD nor the Marine Corps has validated a "persistence" concept or a P-ISR

definition. Without a concept or definition, the Marine Corps, as well as the larger DOD community, will develop systems and concepts that are not compatible with one another and fail to achieve an end state that reflects objectives. In the case of Angel Fire, the Marine Corps developed the system that provided persistent surveillance to satisfy a P-ISR requirement, but later described it as a Wide Area Airborne Surveillance (WAAS) capability.[22] The Marine Corps needs to define persistence and P-ISR so that it reflects the P-ISR requirement and ensures that its P-ISR concept is universally understood and compatible with the larger DOD.

In 2007, DOD established a P-ISR Joint Integrating Concept (JIC). The purpose of a JIC is to provide "an operational-level description of how a Joint Force Commander (JFC), 8 to 20 years into the future, will perform a specific operation or function."[23] Additionally, the P-ISR JIC provides "an operational-level description of how improvements to ISR planning and direction can provide the JFC with increased persistence in observation and collection against elusive targets of interest across the range of military operations (ROMO)."[24] The P-ISR JIC defines neither persistence nor P-ISR. However, it does propose to improve persistence through integrated, synchronized management in the planning and direction of ISR assets through five enabling capabilities: integrated planning and prioritization of information needs, multi-level tasking of ISR assets, global visibility of information needs and ISR assets, automated interfaces, and training and education of ISR managers, operators and analysts.[25] Neither the JIC nor intelligence community writ large has defined P-ISR; however, the JIC concedes that the qualifying entity within the P-ISR concept is gaining and maintaining "persistence."[26]

In April 2008, the Marine Requirements Oversight Council (MROC) approved the MCISR-E Initial Capabilities Document (ICD) which consists of three supporting capability sets that cover the entire intelligence process: P-ISR, Distributed Common Ground Station-Marine

Corps (DCGS-MC), and Intelligence Dissemination and Utilization (IDU). P-ISR comprises those capabilities associated with the planning, direction, and collection functions of the intelligence process (see Appendix C) and addresses the capabilities at the MAGTF level. It separates P-ISR from the common lexicon that labels a single persistent surveillance system as P-ISR, and characterizes P-ISR as a concept that plans for and integrates multiple capabilities to provide the commander a better understanding of the operational environment.[27] MCISR-E has become the Marine Corps' core intelligence document under which to move forward as the first branch of service within DOD to define the P-ISR term and concept.[28] However, by characterizing P-ISR in scope of only planning, direction, and collection functions, there is still a gap between the Marine Corps P-ISR concept and the P-ISR JIC.

The P-ISR JIC focuses on the planning and direction functions of the intelligence process, but also addresses global visibility of ISR assets and automated interfaces as a means to get the right information to the supported commander by providing

> automated tools that facilitate the rapid processing and exploitation of multi-discipline, multi-domain information, developing it into decision-making intelligence products... shrink the sensor-to-shooter time cycle and speed air-to-ground attacks on fleeting high value targets by replacing cumbersome and time-consuming human interfaces.[29]

The Marine Corps states that its P-ISR objective is to provide the supported commander with relevant and continuous battlespace awareness over specified named areas of interest for required periods of time, yet P-ISR encompasses only the planning, direction, and collection functions of intelligence process.[30] Planning, directing, and collecting information does not increase awareness until the information reaches the commander. To be effective, P-ISR has the responsibility to disseminate information to commanders to facilitate utilization. P-ISR needs to improve the plan, direct, and collect functions of the intelligence process, but must also leverage

the entire ISR Enterprise so that the dissemination function of the intelligence process provides available and useable information to the commander and his staff. Therefore, without the dissemination function of the intelligence process, the Marine Corps' P-ISR concept precludes the ability to support the commander with relevant and continuous battlespace awareness, is not compatible with the P-ISR JIC, does not address the requirement, and without characterizing the determining P-ISR factor (persistence), sets the stage for continued limits on the P-ISR concept.

Establishing Persistence

What is "ISR" and how much time is "persistent"? Both the terms "ISR" and "persistent" have very clear meanings. In order to understand the P-ISR concept, one must understand how DOD defines the terms. JP 1-02 defines ISR as:

> An activity that synchronizes and integrates the planning and operation of sensors, assets, and processing, exploitation, and dissemination systems in direct support of current and future operations. This is an integrated intelligence and operations function. Also called ISR. See also intelligence; intelligence, surveillance, and reconnaissance visualization; reconnaissance; surveillance.[31]

Most assume that ISR is just the sensor and platform, such as an Unmanned Aerial System (UAS) and an electro-optical (EO) camera (sensor). The term persistent denotes the temporal aspect of continuous. Thus, applying the "continuous" aspect to the assumption of a single system and its associated sensor, then P-ISR becomes a continuous overhead capability watching a target—the "unblinking eye." It is easy to understand the historical perception. However, the Joint Publication (JP) definition clearly states that ISR is more than a single system. ISR includes the synchronization, planning, collection, AND dissemination of a product from MULTIPLE systems. ISR is an activity that the Marine Corps must combine with a universally understood military definition or concept of persistence.

Although persistent denotes a temporal aspect, neither DOD nor the Marine Corps has

defined the term or concept. Prior to the RMA, persistence meant diligence and perseverance in effort—keeping up the fight day in and day out in the face of adversity (inclement weather, adverse terrain or logistical delays). Battles often had lulls of days or weeks between engagements, and the smaller the lulls, the greater the persistence in battle.[32] Persistence provided the advantage to the force that achieved it or maintained it.

Due to technological advances of the RMA, persistence in battle has come to mean more. The US military has all but eliminated the lull in battle created by limiting human factors such as employing a UAS armed with surveillance and weapons delivery capabilities. The UAS eliminates the pilot in the cockpit and, thus, eliminates the physiological human limitations characteristic of manned aerial platforms. Therefore, persistence has come to mean persistence in engagement.[33] It has become synonymous with "continuing beyond the usual, expected, or normal time: not stopping or going away."[34] Military persistence has come to describe a temporal attribute that is commanding and connotes the historical capability associated with P-ISR. The temporal aspect of "continuous" describes the "un-blinking" eye.

However, when examining the Marine Corps' P-ISR requirement, persistent implies both a temporal and spatial aspect, as well as a more abstract concept that incorporates the idea of persevering obstinately and refusing to let go.[35] The MCVS 2025, POM 12, and the MCISR-E describe the requirement in terms of the spatial aspect (battlespace and operating environment). The documents describe a capability that stems from the ability to plan for and integrate multiple capabilities and the ability to link advanced sensors to provide persistent surveillance "over dense and complex areas" (again, the spatial aspect). However, as the Marine Corps moves forward with its P-ISR requirement, it focuses not only on time duration and space constraint, but also on operational outcome. So how does the Marine Corps achieve persistence? Unlike

the historical concepts, achieving persistence means more than a sensor, network of sensors, or human staring endlessly at a target, never looking away. The principle component in the development of P-ISR is persistence, and thus, the Marine Corps must define the persistence concept.

Colonel Phillip D. Gentile, Executive Assistant to the Marine Corps' Director of Intelligence (DIRINT), clarifies that in terms of the Marine Corps' concept, persistence expands beyond enduring for long periods of time. Commanders achieve persistence through multimodal sensing that increases overall awareness while pursuing a target until achieving the desired operational outcome. "There's a growing picture of contributing pieces from all warfighting functions that come from outside the MAGTF, and outside the area of operations (AO) that are relevant to persistence."[36] The Marine Corps characterizes persistence in terms of time and space, but also includes multi-discipline and multi-sensor collection from all domains and warfighting functions that will yield an increased level of battlespace awareness in support of MAGTF commanders. Thus, the Marine Corps will achieve its concept of persistence through a comprehensive strategy that synchronizes employment and management of multiple ISR assets to include human intelligence (HUMINT), geospatial intelligence (GEOINT), signals intelligence (SIGINT), measurements and signatures intelligence (MASINT), open source intelligence (OSINT), ground reconnaissance and surveillance; and non-traditional assets, such as fixed wing reconnaissance, combat patrols, and biometrics collection. Taking into account the temporal, spatial, and abstract aspects to the Marine Corps' concept, the Marine Corps should define persistence as the frequency and continuity sufficient to persevere continuously until achieving a desired operational outcome.

Characterizing and defining persistence sets the stage for establishing a P-ISR definition.

It is important in context of the larger DOD that the Marine Corps develops an acceptable P-ISR definition so that it becomes a commonly understood term and one that works in the larger lexicon of DOD. For without a validated definition, organizations within DOD will not come to a mutual understanding of P-ISR if some think it's a single system providing persistent surveillance while others think it's a completely different capability altogether.

Defining P-ISR

In September 2009, the Marine Corps launched P-ISR capabilities based assessment (CBA) based on the planning, direction, and collection functions of the intelligence process. The CBA intended to define P-ISR and identify tasks and associated conditions and standards to accomplish the concept (see appendix D). As of September 2010, the Marine Corps had tentatively defined P-ISR as:

> The strategy that synchronizes organic MAGTF ISR collection assets, with support from joint resources and combat support agencies as necessary, to provide the supported commander with relevant and continuous battlespace awareness over specified named areas of interest for required periods of time. [37]

However, the Marine Corps has provided a P-ISR definition that does not reflect the requirement, does not differ from current doctrine, and does not capture the Marine Corps' concept of persistence.

The Marine Corps' definition describes P-ISR as a strategy; however, requirements dictate a capability. MCVS 2025 identifies the need for robust intelligence capabilities and an ability to link advanced sensors, provide persistent surveillance over dense and complex areas, and integrate ISR capabilities to support decentralized decision-making.[38] The POM identified the P-ISR gap as "a limited ability to establish and maintain an integrated, synchronized, all-source collection architecture to enable persistent collection on a defined geometric [area, route,

point] target."[39] MCISR-E describes P-ISR in terms of capabilities associated with the planning and direction of intelligence collection and collection of information functions of the intelligence process. The Marine Corps requires a P-ISR capability, not a strategy. By defining and validating P-ISR as a capability, the Marine Corps' definition will pertain directly to the POM gap and provide a clear objective upon which to build a P-ISR capability.

The tentative P-ISR definition is nebulous at best, and establishes P-ISR as a collaborative process by which to make as much information available to the supported commander as possible to support and improve his decision-making process. And hasn't that always been the goal of Marine Corps Intelligence- reduce uncertainty in the battlespace, support the commander's decision-making process, and collect from all available collection resources? The draft definition simply restates current doctrine. MCDP 2-1: Intelligence Operations states that the first goal of intelligence is "to reduce uncertainty by providing accurate, timely, relevant knowledge about the threat and the surrounding environment,"[40] and that "good intelligence is a result of the integration of many separate and specialized collection, processing and analytical resources."[41] MCDP 2-2: MAGTF Intelligence Collection outlines that in the collection management process; collections operations management "establishes a collection strategy and determines how to collect against requirements."[42] Doctrine already outlines that strategy integrates multiple collection assets to satisfy the requirement. If the P-ISR concept is to differ from doctrine, the Marine Corps needs to change the P-ISR definition to reflect its P-ISR requirement, the accepted DOD ISR definition, and the Marine Corps notion of persistence. The Marine Corps should define P-ISR as

> The capability that synchronizes the employment of the diverse components of the ISR Enterprise to provide the supported commander with relevant and continuous battlespace awareness over specified areas with the frequency and continuity sufficient to persevere continuously until achieving a desired operational outcome.

By establishing a Marine Corps concept of persistence and the restated definition, the Marine Corps' definition accurately reflects persistence, the accepted DOD ISR terminology, as well as the validated requirement. It will establish throughout DOD a validated P-ISR definition that will level the playing field with respect to establishing a universal concept of the historical P-ISR buzzword. Efforts are currently underway that leverage technological advances to achieve a P-ISR capability that was predicted in the RMA, portrayed 20 years ago in Hollywood, and more importantly, stated in the 2008 MGL as the top Marine Corps intelligence requirement. Recently, critics regard the P-ISR concept as unachievable, but current technology overcomes the obstacles responsible for the perceived impossibility and outlines an architecture that is congruent with the Marine Corps' requirement

ACHIEVING THE CAPABILITY

Overcoming Challenges

In 2007, Major Todd Hogan proposed in a thesis at the US Army Command and General Staff College that DOD cannot achieve a P- ISR capability in the near future.[43] The thesis acknowledged that most conceptual P-ISR frameworks focus on the UAS, but a true P-ISR capability will require the ability to network a vast array of sensors. The thesis accurately reflects the Marine Corps' desired endstate to execute a strategy that utilizes multimodal sensing. Additionally, the thesis reinforces the P-ISR problem that stems from no validated P-ISR concept or definition within DOD. Hogan addressed P-ISR at the macro level (DOD), and from that perspective, P-ISR is much more difficult to achieve. Because it focused broadly on DOD, Hogan's thesis does not identify a conceptual P-ISR framework, establish a concept of persistence, or define P-ISR.

The Marine Corps focuses its P-ISR effort at the tactical level — MEF level and below,

and has been more specific in defining P-ISR. At the DOD level, Hogan concluded that P-ISR was not achievable due to a lack of sufficient collection sensors, broken intelligence lines of communication (LOC), an overwhelming volume of collected information, and security concerns.[44] However, if the Marine Corps formally establishes the concept of persistence, characterizes P-ISR to incorporate the disseminate function of the intelligence process, and formally defines P-ISR, it will accurately address the requirements and gaps identified in the MCVS 2025, POM, MGL, and MCISR-E. The Marine Corps can then leverage available capabilities that specifically address the requirement, and in the process, overcome those obstacles that prevent a P-ISR capability at the macro level.

Lack of Sensors

In his P-ISR Dilemma thesis, Hogan posits that there are simply not enough surveillance and reconnaissance sensors in DOD's inventory to be a persistent capability.[45] In the context of Marine Corps P-ISR, persistence is the characteristic of utilizing multimodal sensing to persevere obstinately and refusing to let go until achieving desired operational outcome. Thus, the Marine Corps does not lack sensors or collection capabilities, but rather, requires a means to achieve persistence. The P-ISR issue concerning sensors is that there is a problem with integrating the current capabilities in the Marine Corps' inventory. The capabilities in the inventory have historically operated as independently on the battlefield. Bringing them together is the challenge to creating persistence.[46] Although the P-ISR JIC proposes to improve persistence through integrated, synchronized management in the planning and direction of ISR assets for the 2014 to 2026 timeframe, it does not call for additional sensors. Therefore, P-ISR is not a new way to plan, direct, or collect information. P-ISR is a convergence of current capabilities into a process that paints a picture.

The largest effort that addresses the Marine Corps' P-ISR requirement is the Naval Post Graduate School's P-ISR Product Line Architecture (PLA). A PLA defines a structure for an extensible family of reconfigurable systems and centers on a system optimized to use both existing systems and systems that have yet to be developed.[47] The P-ISR PLA targets the Marine Corps tactical level (MAGTF). It is designed to create battlespace awareness by optimizing planning, directing, collecting, processing, and distribution of information collected from existing Marine Corps collection assets — a goal that is harmonious with a P-ISR concept that leverages the ISR Enterprise to incorporate all functions of the intelligence process (see Appendix D). It will enable "leaders at all echelons to synchronize organic MAGTF and joint apportioned collection assets in the battlespace by providing them with timely, relevant, and continuous awareness within their respective named areas of interest (NAI)."[48]

The PLA approach recognizes that the requirement focuses on intertwined capabilities rather than creating new platforms or capabilities. It focuses on horizontally integrating what already exists, government off the shelf (GOTS) items and commercial off the shelf (COTS) items, by developing software that creates operational efficiency across what have traditionally been "stovepiped" domains. In the context of COTS and GOTS, "off the shelf" refers to "items that configure easily and work out of the box and are easy to find and procure."[49] In other words, automated interfaces and smart technology can network together current systems and display information across what has traditionally been broken LOCs.

Broken Intelligence LOCs

One primary intelligence lesson learned from Operation Iraqi Freedom (OIF) was that service-specific ISR assets and intelligence architectures were not compatible with one another. Military services did not consider interoperability with their DOD brethren until after developing

systems and related architectures. Consequently, information obtained by service-specific assets was limited to that service, severely limiting information sharing. Additionally, for service-specific information, only 25 to 30 percent of collected information actually made it to the user.[50] The P-ISR PLA addresses these issues to ensure interoperability within DOD and to ensure the right information gets to the right person at the right time.

The P-ISR PLA architecture provides the ability to access stored data through the DCGS-MC Integration Backbone (DIB), and other information servicing systems used by the Marine Corps. DCGS-MC provides the means for performing all aspects of ISR processing, exploitation, analysis, and production by Marine Corps intelligence units, and is part of DOD's larger DCGS Enterprise. The DCGS Enterprise is

> A net-centric, interoperable architecture that enables the continual, unimpeded sharing of data, information, and information services with and between the Armed Services, Combat Support Agencies, National Intelligence Agencies, Combatant Commands, and multinational partners in support of the JTF command level and below.[51]

The DIB of this Enterprise establishes standards, protocols, applications, and common database infrastructure that create interoperability between services and throughout DOD. Therefore, the PLA architecture, through access to the DIB, allows collected information across the joint domain to be available to the MAGTF commander and his staff based upon his or her requirements.

The P-ISR PLA architecture is complex and complicated, but implements a vast array of smart technology and interfaces to get the right information to the right person at the right time. The architecture networks together the sensors/collectors with the MAGTF commander and his staff (user) through a user interface (UI) (see Appendix E). The sensors and collectors are those traditional and non-traditional assets that Marines employ to obtain desired information and include, but are not limited to, manned and unmanned aerial platforms; tactical human and

signals intelligence; terrestrial sensing; cyberspace exploitation; combat reporting; biometrics data; and archived reports. The significant aspect of the relationship between the UI and user becomes the manner in which the information is displayed and in what format.

The UI utilizes current technology with which most individuals are familiar—web-based format. The UI (such as Internet Explorer) will allow "operators to manage an array of sensor resources to provide timely intelligence information."[52] It displays what sensors see without the need for a "user's manual" or in depth training.[53] However, with the network of sensors and collectors, the combined view becomes a significant task of the UI. The UI provides multiple sensor data overlaid on top of maps in tiled format to provide different views to the user.[54] The user can then further access the desired information with greater fidelity by turning tiles on or off or "left clicking" on an icon or overlaid script to access additional information. A problem with the UI, however, during an ongoing operation at the tactical level is the vast amounts of available information. The P-ISR PLA recognizes this challenge and through smart technology and automated interfaces, addresses the problem.

Vast amounts of information

The P-ISR PLA utilizes a capability that provides "sensor data processing and reasoning to transform raw sensor information into updated beliefs about the world state"— the Situational Awareness (SA) Subsystem.[55] The bottom line with this capability is that the P-ISR PLA employs through smart technology a means by which the user can direct the system to recognize priority or relevant information as it pertains to the mission or operation. The PLA requires user input to establish conditions of interest (COI), which represents the user's priority information requirements as they pertain to that specific mission or operation. The P-ISR PLA assists with collection management by recommending through automation those available assets in the

battlespace best suited to achieve or answer the COI. The system then employs a series of filters during collection that discard irrelevant information that can overwhelm the user. The system disseminates notifications through formats with which the user is most likely familiar (such as through chat, text, or email) that sensors collected priority information or priority information is available.

The P-ISR PLA disseminates notifications through messaging, alerts, and external dissemination components (EDC).[56] The important element among these three is the EDC. The EDC represents the components that "handle a processed alert to actually send to a user or set of users."[57] The alert reaches the user via simple mail transfer protocol (SMTP), more commonly known as "email", and internet relay chat (IRC). The user can define the means by which to receive information — email if on the move with a handheld device or via chat to include a chat display on the system that broadcasts privately or to multiple users. Regardless, the P-ISR PLA is capable of "optimizing data collection, information analysis processes, and information dissemination towards delivering the highest value information without overwhelming the human user(s)" by using dissemination methods with which the user is most likely already familiar.[58]

Security

Historically, multiple levels of security involved in collection assets and their products have affected intelligence dissemination. Security pertains to classification levels of intelligence and who has access to that intelligence.[59] The Marine Corps P-ISR concept easily addresses security issues by establishing that P-ISR is a convergence of existing capabilities. Units that have historically had access to certain intelligence classification levels will continue to have access to that intelligence at that classification level. P-ISR will bring classified capabilities to

which that unit has access together to gain and maintain the Marine Corps' concept of persistence. Thus, security and classification levels have no significant impact on the P-ISR concept. However, P-ISR addresses additional security concerns by integrating and adhering to DOD's larger DCGS Enterprise which incorporates the governance and standards established by DOD that deal with information assurance and security policies.

CONCLUSION AND RECOMMENDATIONS

The RMA projected that an information revolution would enable DOD to network together multiple sensors to provide real time surveillance over large geographical areas in all weather conditions where advanced automated systems would disseminate vast amounts of collected data to US forces. Ironically, this posed capability reflects the Hollywood example where the enemy has no place to hide without exposing himself to some means of intelligence collection. In the past, the ISR community dismissed the ability to link together multiple sensors to achieve this "unblinking eye" capability and focused on achieving a P-ISR capability by improving single collection platforms to provide the "unblinking eye." However, DOD never defined persistence or P-ISR, and consequently, these "P-ISR" collection platforms provided nothing more than persistent surveillance.

The Marine Corps has formally identified a P-ISR requirement, and has moved forward as the first branch of service to characterize a P-ISR capability and define the P-ISR term. However, the Marine Corps has limited the P-ISR scope to the planning, directing, and collection functions of the intelligence process. Therefore, the P-ISR concept fails to recognize P-ISR's responsibility to the dissemination function of the process to achieve the desired endstate as stated in the draft P-ISR definition. Additionally, the P-ISR characterization does not address the automated interface enabling capability as outlined in the P-ISR JIC. Therefore, the Marine

Corps' concept is not completely congruent with the P-ISR JIC, yet Joint interoperability is integral to the Marine Corps' P-ISR concept.[60] The Marine Corps needs to change its P-ISR characterization and it can make this change through defining persistence and redefining P-ISR.

In order to accurately characterize and define P-ISR, the Marine Corps must define persistence. The historical P-ISR connotation results from combining a denotation of persistence with single system capabilities to create an "unblinking eye." The single system "unblinking eye" does not represent the Marine Corps' concept of P-ISR. The Marine Corps' persistence concept is more abstract and serves as the foundation to the P-ISR definition. Yet, neither doctrine nor requirements documents define the persistence concept. The proposed definition in this paper captures the Marine Corps' concept of persistence. The Marine Corps should validate this concept through established processes. After validating the concept, the Marine Corps should then codify persistence in the service intelligence operating concept (the MCISR-E), and use the concept to serve as the foundation to redefining P-ISR.

The Marine Corps must redefine P-ISR to reflect persistence and the requirement. Doing so will differentiate P-ISR from current doctrine. The Marine Corps must then codify and institutionalize the P-ISR definition. By incorporating a validated and codified concept of persistence, the Marine Corps can combine the accepted DOD definition of ISR with persistence to capture Marine Corps requirements and acknowledge P-ISR's responsibility to the dissemination function of the intelligence process. If the Marine Corps updates the MCISR-E with the new definition that leverages the entire ISR Enterprise, then the Marine Corps can still depict P-ISR in the scope of plan, direct, and collect, and no further changes to the P-ISR characterization will be necessary. Once codified in MCISR-E, the Marine Corps must initiate efforts to institutionalize P-ISR into Intelligence doctrine so that the concept is both understood

and separate from current doctrinal practices.

Finally, by defining persistence and re-defining P-ISR, the Marine Corps will capture the P-ISR requirement. The Marine Corps will be better postured to leverage current P-ISR efforts that accurately reflect the Marine Corps' desired capability. This current effort is the Naval Post Graduate School's P-ISR PLA, which addresses those obstacles once thought to preclude a true P-ISR capability. The PLA shows that the P-ISR capability is a reality, and this reality is reminiscent of the fictitious Hollywood example and the postulated RMA capabilities. The Marine Corps must find a way to adjust their acquisition processes so that it can take advantage of this revolutionary capability and field it to the operating forces. Once fielded, then the Marine Corps can take further steps to study how this P-ISR capability affects doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF); and recommend those changes necessary to institutionalize the concept.

---

[1] Phillip Noyce and others, *Patriot Games* (Hollywood, CA: Paramount Pictures, 1992), DVD.

[2] Tony Scott and others, *Enemy of the State* (Burbank, CA: Touchstone Pictures, 1998), DVD.

[3] Joseph S. Nye and William A. Owens, "America's Information Edge," *Foreign Affairs* 75, no. 2 (March-April 1996): 20-23.

[4] Ibid, 23-24.

[5] Donald C. Latham, "Pursuing ISR's Holy Grail: Persistent Surveillance, Integrated Sensor and Strike Systems," *Intelligence, Surveillance, and Reconnaissance Journal* 2, no. 4 (July-August 2003): 40.

[6] U.S. Department of Defense, *Persistent Intelligence, Surveillance, and Reconnaissance: Planning and Direction, Joint Integrating Concept,* Version 0.7. Washington, DC: Government Printing Office, 14.

[7] U.S. Department of Defense, *Persistent Intelligence, Surveillance, and Reconnaissance: Planning and Direction, Joint Integrating Concept,* Version 1.0., Washington, DC: Government Printing Office, 3.

[8] Geoff Fein, "U.S. Forces Need More Persistent ISR, Ability To Move Data Across Battlefield," *Defense Daily*, November 30, 2007. http://findarticles.com/p/articles/mi_6712/is_41_236/ai_n29399231/, accessed 2 Feb 2011.

[9] Lockheed Martin Product Card, "High Altitude Airship (HAA) - Global Persistent ISR Always There, Always On," 2008.

http://www.lockheedmartin.com/data/assets/ms2/High_Altitude_Airship_productcard.pdf, accessed February 1, 2011.

[10] Ron Stearns, "Unmanned, Persistent ISR," *Avionics Magazine*, Thursday January 1, 2009, http://www.aviationtoday.com/av/issue/feature/28586.html. accessed February 1, 2011.

[11] Ryan J. Gulden, Major, USAF, "Near-Space Airships: The Solution to Persistent ISR," Air Command and Staff College, Air University, March 2010.

[12] Joint Urgent Operational Needs Statement (JUONS) CC-0154 Dec 2006.

[13] U.S. Department of Defense, *Department of Defense Dictionary of Military and Associated Terms,* JP 1-02, (Washington, D.C.: 8 November 2010), 281.

[14] Comandant of the Marine Corps, "U.S. Marine Corps Vision and Strategy 2025," 18 June 2008, 15, 20-22.

[15] Headquarters U.S. Marine Corps, Intelligence Department, *Fundamentals of Resourcing: Program Objective Memorandum Guide,* (Washington, DC: U.S. Marine Corps, 2008), 4.

[16] Headquarters Marine Corps, Combat Development & Integration (HQMC, CD&I), "MROC Decision Memorandum 18-2009: MAGTF Gap List for POM 12", 27 March 2009, 15.

[17] Ibid.

[18] Headquarters Marine Corps, Combat Development & Integration (HQMC, CD&I), "USMC PISR CBA: Mission and Capabilities Analysis Report," February 2010, 2.

[19] Headquarters U.S. Marine Corps, Intelligence Department, "Marine Corps ISR Enterprise Roadmap", 28 April 2010, 2.

[20] Greg Meuller, "Leaders discuss enterprise approach to support training of a 21st century Army," *Army.mil,* February 26, 2010, http://www.army.mil/-images/2010/02/26/65438/index.html (accessed March 9, 2011).

[21] Headquarters Marine Corps, Combat Development & Integration (HQMC, CD&I), "USMC PISR CBA: Mission and Capabilities Analysis Report," February 2010, 9.

[22] Michael Hoffman, "New Reaper Sensors Offer a Bigger Picture," Air Force Times Online, February 16, 2009, http://www.airforcetimes.com/news/2009/02/airforce_WAAS_021609/, accessed February 5, 2011.

[23] Chairman of the Joint Chiefs of Staff, Joint Operations Concepts Development Process, CJCSI 3010.02B, (Washington, D.C.: 27 January 2006), A-2.

[24] *Persistent Intelligence, Surveillance, and Reconnaissance Planning and Direction: Joint Integrating Concept,* 2-28.

[25] Ibid, 3.

[26] Ibid

[27] Headquarters U.S. Marine Corps, *Marine Corps Intelligence, Surveillance, and Reconnaissance Enterprise Initial Capabilities Document*, Version 1.4, 30 September 2010.

[28] Lieutenant Colonel David Yost, interview with author, 16 January 2011.

[29] *Persistent Intelligence, Surveillance, and Reconnaissance Planning and Direction: Joint Integrating Concept*, 11.

[30] *Marine Corps Intelligence, Surveillance, and Reconnaissance Enterprise Initial Capabilities Document*, F-5.

[31] *Department of Defense Dictionary of Military and Associated Terms*, 183

[32] Gregory A. Grimes, "Persistence as the 10th Principle of War," *smallwarsjournal.com,* 2008, http://smallwarsjournal.com/blog/journal/docs-temp/62-grimes.pdf (accessed March 9, 2011).

[33] Ibid.

[34] Merriam Webster's Learner's Dictionary Online, s.v. "persistent." http://www.learnersdictionary.com/search/persistent (accessed February 2, 2011).

[35] Lieutenant Colonel David Yost, email to author, 24 March 2010.

[36] Colonel Phillip D. Gentile, interview with author, January 12, 2011.

[37] *Marine Corps Intelligence, Surveillance, and Reconnaissance Enterprise Initial Capabilities Document*, F-5.

[38] Commandant of the Marine Corps, 20.

[39] "MROC Decision Memorandum 18-2009: MAGTF Gap List for POM 12", 15.

[40] Headquarters U.S. Marine Corps, *Intelligence Operations*, MCWP 2-1, (Washington, DC: 10 September 2003), 1-1.

[41] Ibid, 1-6.

[42] Headquarters U.S. Marine Corps, *MAGTF Intelligence Collections*, MCWP 2-2, (Washington, DC: 30 July 2004), 1-8.

[43] Todd C. Hogan, "The Persistent Intelligence, Surveillance, and Reconnaissance Dilemma: Can the Department of Defense Achieve Information Superiority?" (Masters Thesis, U.S. Army Command and General Staff College, 2007), 7.

[44] Hogan, 30.

[45] Ibid.

[46] Colonel Phillip D. Gentile, interview with author, January 12, 2011.

[47] Rick Hayes-Roth, "A Product Line Approach to Persistent Intelligence, Surveillance, and Reconnaissance (PISR)", Naval Post Graduate School, February 2011, i.

[48] Ibid, 1.

[49] Lieutenant Colonel David Yost, email to author, 24 March 2010.

[50] Hogan, 26-30.

[51] Headquarters U.S. Marine Corps, "Capability Development Document for Distributed Common Ground/Surface System Marine Corps (DCGS-MC) Enterprise (Program of Record Increment 1)", 15 January 2010, i.

[52] Hayes-Roth, 14.

[53] Ibid, 18.

[54] Ibid, 21.

[55] Ibid, 5.

[56] Ibid, 28.

[57] Ibid, 29.

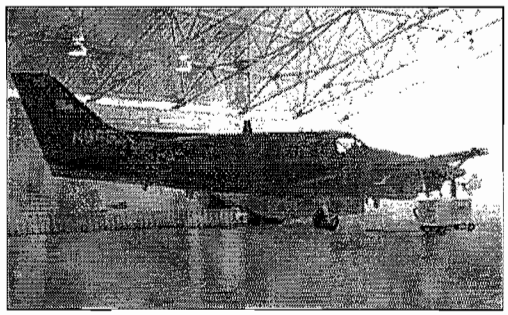
[58] Ibid, 32.

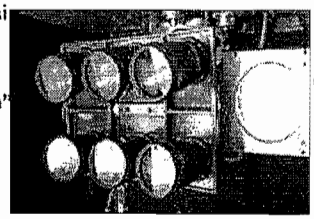
[59] Hogan, 36.

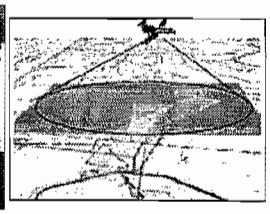
[60] Bobby Straight, "P-ISR Congressional Testimony," (information paper, Marine Corps Combat Development Command, 13 July 2010).

Angel Fire

- 4 OCONUS; 1 CONUS
- Wide-area electro-optic staring sensor
  - Provides scalable medium city coverage
  - 4km to 4km at 0.5 Meter GSD
- Data Storage & Distribution System
  - Air to Ground near real time
    - 1-2 frame/sec with<10 sec latency
  - Ground
    - Encrypted point to point, 3 locations
  - 7 days of data for local, tactical playback analysis
  - 30+ days for operational (HHQ) forensi analysis/intelligence fusion
- Software
  - GUI Interface similar to "Google Earth"
  - Multiple, simultaneous users
- Deployed system availability
  - 14 hours dawn-to-duskx 365 days







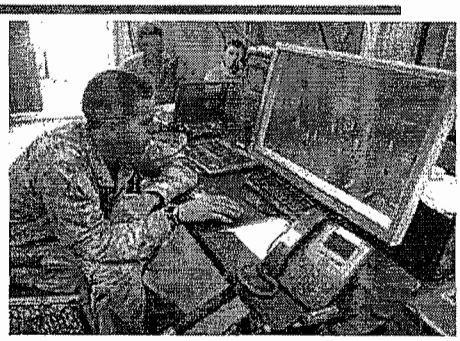
UNCLASSIFIED // FOUO

5

Operational Employment

Phase I Near Real Time Current Operations

- Who: Operating Marines
  - Situational awareness of AO
- What: Ground User Stations
  - <10 sec latency
  - Provided & maintained by Angel Fire Team
  - Training<30 min
- Why: Support counter IED, counter-insurgency ops, force protection, C2, and observe Iraqi military forces
- Where: Company COC, BN COC and S-2, RCT COC and S-2, TFC



Phase II & III Exploitation

- Who: USMC TFC, NGA analysts (4)
- What: Forensic analysis links activities
  - Angel Fire Team provides 7-day and 30+ day storage capacity
  - NGA provides hard drives for delivery to CONUS

    Imagery repositories (Navy Yard, Dalghren)
- Where: Tactical Fusion Center

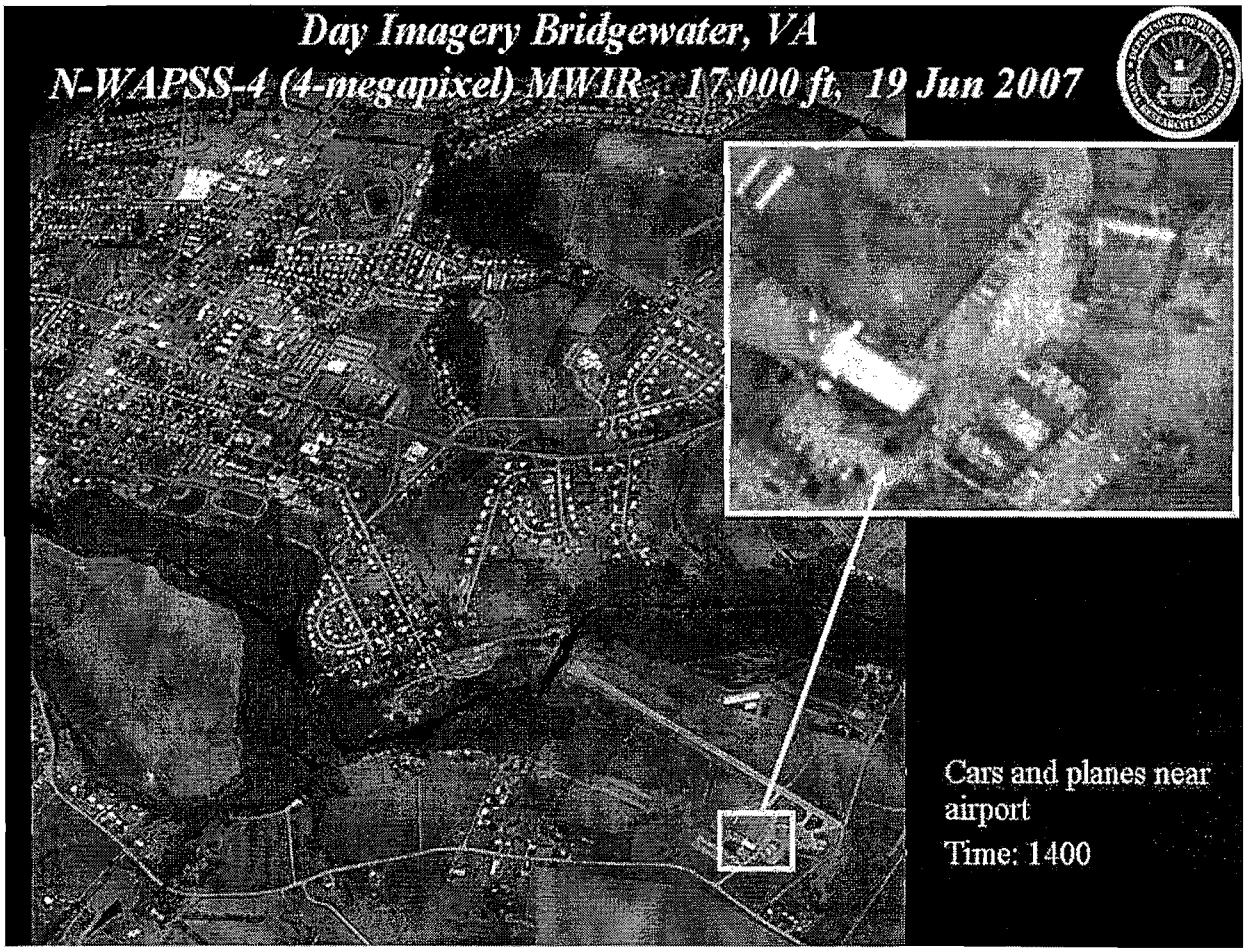
Missions

- CIED
- SIGACT Reporting and Analysis
- Mission Planning
- Command and Control
- Cross Cue HD/LD Assets
- I&W for the QRF
- Tactical & Operational Overwatch
  - Iraqi Forces
  - Other Lines of Operation
- Post event forensic analysis

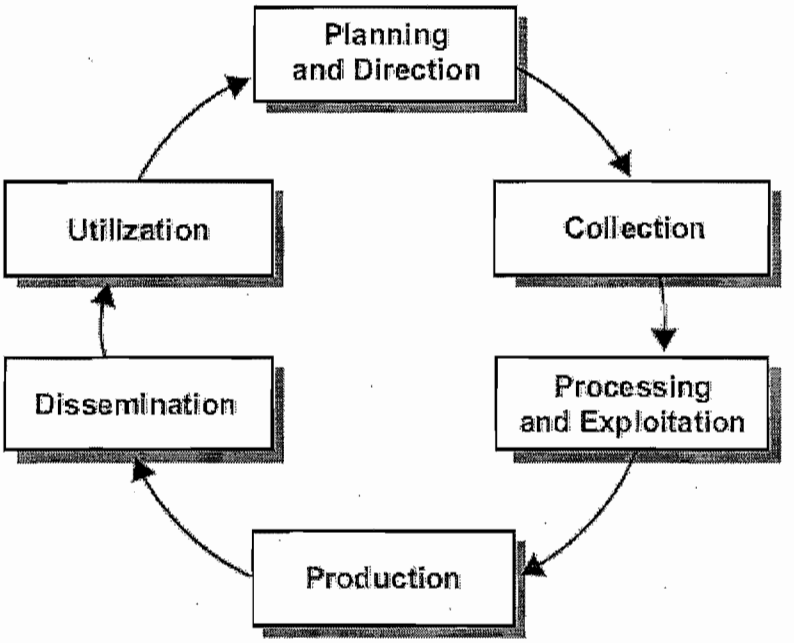
UNCLASSIFIED // FOUO

6

APPENDIX B- ANGEL FIRE IMAGERY

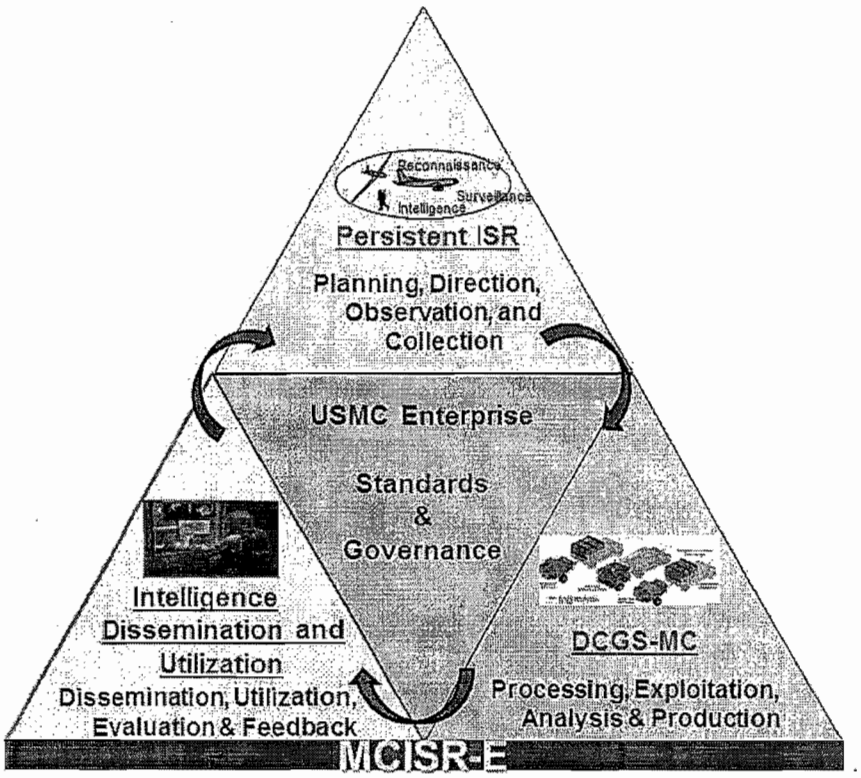


APPENDIX C- USMC INTELLIGENCE PROCESS AND KEY CONSIDERATIONS

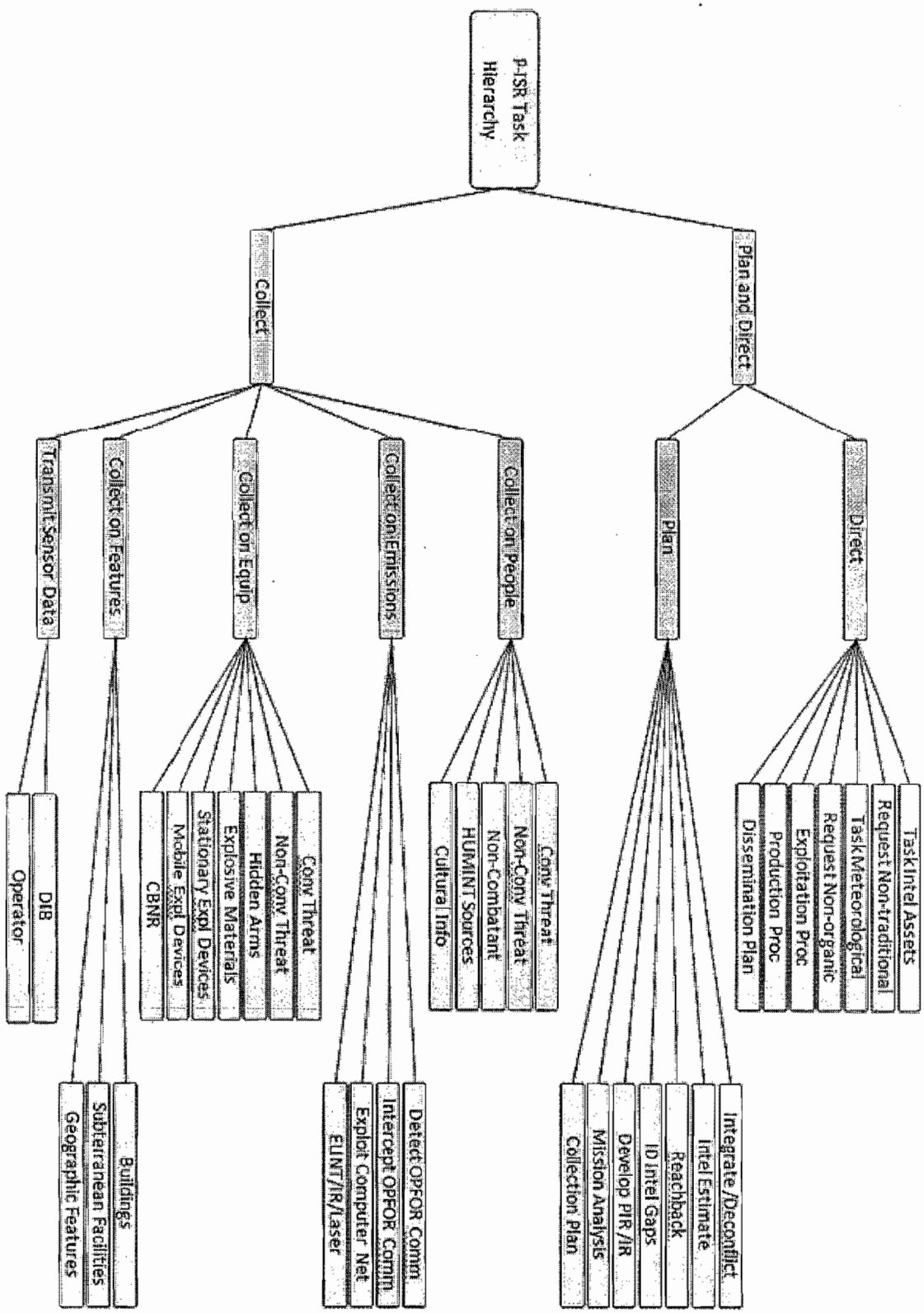


Intelligence Cycle	Key Considerations
Planning and direction.	Identify intelligence requirements. Plan intelligence operations and activities. Support the formulation of the commander's estimate of the situation.
Collection.	Develop the required intelligence structure. Use organic, attached, and supporting intelligence sources to collect intelligence.
Processing, exploitation, and production.	Conversion of raw data and information into a suitable form of intelligence.
Dissemination.	Timely provision of intelligence, in appropriate form, to those who need it.
Utilization.	Use of intelligence.

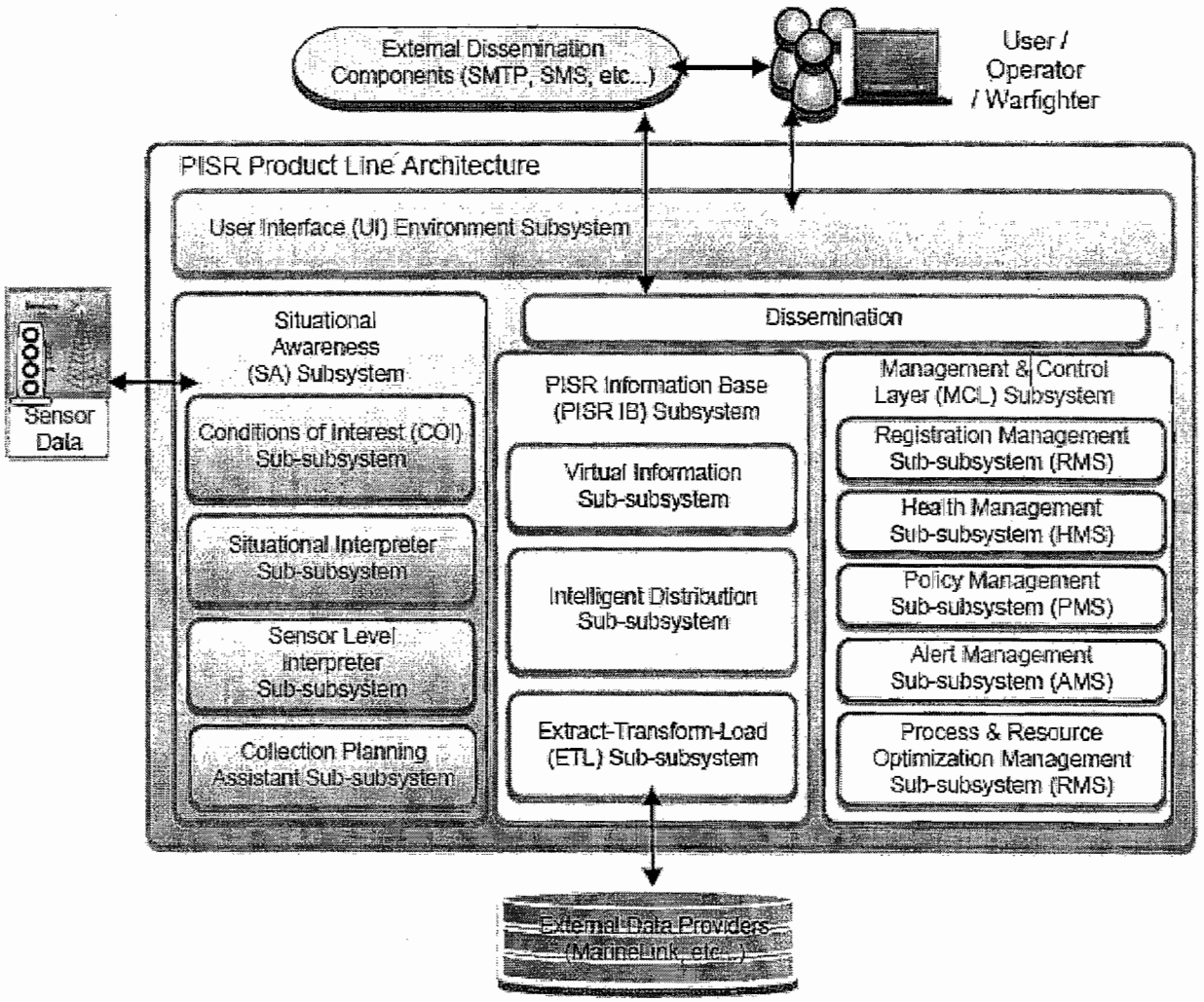
APPENDIX D- MCISR-E



APPENDIX E- P-ISR TASKS



APPENDIX F- P-ISR PRODUCT LINE ARCHITECTURE CONCEPT



BIBLIOGRAPHY

Boyne, Walter J. *Operation Iraqi Freedom: What Went Right, What Went Wrong, and Why.* New York, NY: Tom Doherty and Associates, LLC, 2003.

Chairman of the Joint Chiefs of Staff. *Joint Operations Concepts Development Process.* CJCSI 3010.02B, Washington, D.C.: January 27, 2006.

Clark, Colin. "Transformation or Persistent ISR." *DOD Buzz: Online Defense and Acquisition Journal*, October 13, 2008. http://www.dodbuzz.com/2008/10/13/transformation-or-persistent-isr/, (accessed February 1, 2011).

Colarusso, Laura M. "Airmen, Predators Respond to IED Threat.." *Air Force Times*, (April 4, 2005). http://www.proquest.com/.

Commandant of the Marine Corps. *Marine Corps Vision and Strategy 2025.* Washington, DC: Headquarters, U.S. Marine Corps, June 18, 2008.

Dale, Catherine. *Operation Iraqi Freedom: Strategies, Approaches, Results, and Issues for Congress.* CRS Report of Congress RL34387. Washington, DC: Congressional Research Service, March 28, 2008.

Fein, Geoff. "U.S. Forces Need More Persistent ISR, Ability To Move Data Across Battlefield." *Defense Daily*, November 30, 2007. http://findarticles.com/p/articles/mi_6712/is_41_236/ai_n29399231/, (accessed February 2, 2011).

Gordon, Michael R. and General Bernard E. Trainor. *Cobra II: The Inside Story of the Invasion and Occupation of Iraq.* New York, NY: Pantheon Books, 2006.

Grimes, Gregory A. "Persistence as the 10th Principle of War." *smallwarsjournal.com*, 2008, http://smallwarsjournal.com/blog/journal/docs-temp/62-grimes.pdf (accessed March 9, 2011).

Gulden, Ryan J. "Near-Space Airships: The Solution to Persistent ISR." Masters Thesis, Air University, 2010.

Hayes-Roth, Rick. "A Product Line Approach to Persistent Intelligence, Surveillance, and Reconnaissance (PISR)." Working paper, Naval Post Graduate School, February 2011.

Headquarters Marine Corps, Combat Development & Integration (HQMC, CD&I). *Capability Development Document for Distributed Common Ground/Surface System Marine Corps (DCGS-MC) Enterprise (Program of Record Increment 1).* January 15, 2010.

Headquarters Marine Corps. Combat Development & Integration (HQMC, CD&I). *MROC Decision Memorandum 18-2009: MAGTF Gap List for POM 12*. March 27, 2009.

Headquarters Marine Corps. Combat Development & Integration (HQMC, CD&I). *USMC PISR CBA: Mission and Capabilities Analysis Report*. February 2010.

Headquarters Marine Corps. Combat Development & Integration (HQMC, CD&I). *USMC PISR CBA: Solutions Approach Analysis Report*. July 2010.

Headquarters Marine Corps, Intelligence Department. *Fundamentals of Resourcing: Program Objective Memorandum Guide*. provided by Major Josh Norris, MCCDC, March 2011.

Headquarters Marine Corps, Intelligence Department. *Marine Corps Intelligence, Surveillance, and Reconnaissance Enterprise Initial Capabilities Document*. Version 1.4, September 30, 2010.

Headquarters U.S. Marine Corps, Intelligence Department. *Marine Corps Intelligence, Surveillance, and Reconnaissance Enterprise Roadmap*. April 28, 2010.

Headquarters U.S. Marine Corps. *Ground Combat Operations*. MCWP 3-1. Washington, DC: Headquarters U.S. Marine Corps, November 27, 2002.

Headquarters U.S. Marine Corps. *Intelligence Operations*. MCWP 2-1. Washington, DC: Headquarters U.S. Marine Corps, September 10, 2003.

Headquarters U.S. Marine Corps. *MAGTF Intelligence Collection*. MCWP 2-2. Washington, DC: Headquarters U.S. Marine Corps, July 30, 2004.

Headquarters U.S. Marine Corps. *Strategy*. MCDP 1-1. Washington, DC: Headquarters U.S. Marine Corps, November 12, 1997.

Hoffman, Michael. "New Reaper Sensors Offer a Bigger Picture." *Air Force Times Online*, February 16, 2009, http://www.airforcetimes.com/news/2009/02/airforce_WAAS_021609/, (accessed February 5, 2011).

Hogan, Todd C. "The Persistent Intelligence, Surveillance, and Reconnaissance Dilemma: Can the Department of Defense Achieve Information Superiority?" Masters Thesis, U.S. Army Command and General Staff College, 2007.

Kerr, Peter-John H. "Persistent ISR Demands: The Marine Unmanned Aerial Vehicle Squadron." *Marine Corps Gazette* 90, no. 5, (May 2006): 31-32. http://www.proquest.com/.

Krueger, Todd C. "Persistent ISR from UAVs: Doctrinal Considerations for Operational Warfare," Masters Thesis, Naval War College, 2006.

Lash,Tom. "Integrated Persistent ISR." *Geospatial Intelligence Forum: the Official Publication of the United States Geospatial Intelligence Foundation, GIF* 2010 Volume: 8 Issue: 4 (May), http://www.geospatial-intelligence-forum.com/mgt-archives/248-gif-2010-volume-8-issue-4-may/2888-integrated-persistent-isr.html, accessed 2 Feb 2011.

Latham, Donald C. " Pursuing ISR's Holy Grail: Persistent Surveillance, Integrated Sensor and Strike Systems." *Intelligence, Surveillance, and Reconnaissance Journal* 2, no. 4 (July-August 2003): 40-43.

Lockheed Martin. *High Altitude Airship (HAA) - Global Persistent ISR Always There, Always On.* product card, 2008. http://www.lockheedmartin.com/data/assets/ms2/High_Altitude_Airship_productcard.pdf, (accessed February 1, 2011).

Meuller, Greg. "Leaders discuss enterprise approach to support training of a 21st century Army." *Army.mil*, February 26, 2010, http://www.army.mil/-images/2010/02/26/65438/index.html (accessed March 9, 2011).

Murray, Williamson and Robert H. Scales, Jr. *The Iraq War: A Military History.* Cambridge, MA: The Belknap press of Harvard University Press, 2003.

Nye, Joseph S., and William A. Owens. "America's Information Edge." *Foreign Affairs* 75, no. 2 (March-April 1996): 20-36.

Office of Naval Research. *Broad Agency Announcement (BAA): GWOT Focused Tactical Persistent Surveillance.* Announcement number 07-014. http://www.onr.navy.mil/~/media/Files/Funding-Announcements/BAA/2011/11-014.ashx, accessed 12 February 2011.

RAND Corporation, Project Air Force. *Methodology for Improving the Planning, Execution, and Assessment of Intelligence, Surveillance, and Reconnaissance Operations*. Technical Report. Arlington, VA: RAND Corproration, 2008.

Reiley, Matthew A. "Transforming USMC Intelligence to Address Irregular Warfare." Masters Thesis, Marine Corps University, 2008.

Sherman, Jason. "Competition Launched for Sea-Surveillance UAV Project set to Ease Open-Ocean Watch." *Navy Times*, April 19, 2004. http://proquest.com/.

Stearns, Ron. "Unmanned, Persistent ISR." *Avionics Magazine*, Thursday January 1, 2009, http://www.aviationtoday.com/av/issue/feature/28586.html. (accessed February 1, 2011).

Straight, Bobby , "P-ISR Congressional Testimony." Information Paper, Marine Corps Combat Development Command, July 13, 2010.

Tiron, Roxana. "Persistent ISR: Navy Enters Critical Year for Maritime Domain Awareness Efforts." *Seapower* 51, no. 5, (May 2008): 40-43. http://www.ebscohost.com.

U.S. Department of Defense. *Department of Defense Dictionary ofMilitary and Associated Terms*. JP 1-02. Washington, D.C.: November 8, 2010.

U.S. Department of Defense. *Persistent Intelligence, Surveillance, and Reconnaissance: Planning and Direction, Joint Integrating Concept* Version 0.7. Washington, DC: Government Printing Office, 2006.

U.S. Department of Defense. *Persistent Intelligence, Surveillance, and Reconnaissance: Planning and Direction, Joint Integrating Concept* Version 1.0. Washington, DC: Government Printing Office, 2007.

U.S. Department of Defense, Quadrennial Defense Review February 6, 2006.

U.S. Department of Defense, Quadrennial Defense Review February 1, 2010.